Search for anomalies in a cross-section of thermal neutrons interaction with titanium hydride

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In many of Physics Laboratories all over the world there has recently arisen an interest to experiments related to thermal neutrons interaction with hydrides and deuterides of transition metals. Namely, these are the experiments associated with abnormally large interaction cross-sections of thermal neutrons with hydrogen nuclei included as compounds to a molecule of for example titanium hydride. The developed by today theory of the considered phenomenon explains this property of the cross-section by the fact that at low energies of neutrons ($E_n < 1.0eV$) that are lower than the energy of hydrogen atoms coupling in metals the mechanism of neutrons interaction with hydrogen atoms changes. The peculiar results available today require careful testing, comprehension and, probably, new interpretation. Thus, there appeared the necessity of measuring full interaction cross-sections of low-energy neutrons and hydrogen atoms in coupled condition. The source of thermal neutrons put forward in the present paper is developed on the base of tandem electrostatic Van de Graaf accelerator EGP-10. Primary neutrons were generated through bombarding a thick beryllium target with deuterons. The registration of thermal neutrons was performed with the aid of ^{3}He-counter. In the paper there are described the following parameters: geometry of measurements, neutron source parameters, methods of producing a sample of titanium hydrides. The data on studying position of thermal neutrons maximum in a moderator and the data on neutron spectra depending on the direction of air channel aimed at radiation withdrawal are available as well. There are estimated the fluence of thermal neutrons falling on a detector as well as preliminary data on interaction cross-section of thermal neutrons with titanium hydride. At the first stage there was set up a task of determining full interaction cross-section of thermal neutrons with titanium hydride possessing different structure: in the form of small crystallites and in amorphous state. Additional data on the character of neutrons interaction with metal hydrides will be obtained at studying radiation capture cross-sections and spectra of gamma-quanta.

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